

Air Force Civil Engineer Center

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**Site LF004 Landfill
Remedial Action**

**BCT Conference Call
19 December 2019**



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LF004 Recent and Upcoming Activities

- **Draft 2018 annual landfill inspection report under regulatory review since 17 Jun 2019**
- **Annual landfill inspection completed 23 Oct 2019. Minor landfill repairs scheduled in Dec 2019.**
- **Planning in progress for decommissioning of SVE and IWAS treatment systems**
- **Semi-annual (Nov 2019) PDB sampling complete. Analytical data pending**

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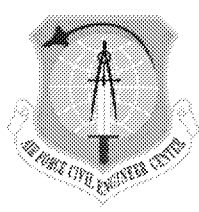
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**Site FT002
Fire Training Area Remedial
Action**

**BCT Conference Call
19 December 2019**

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Site FT002 Update

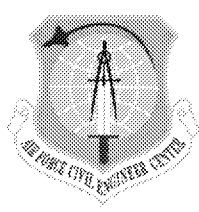
- **AF approved keeping the DEUR in place Nov 2018**
- **AF will prepare Explanation of Significant Differences (ESD) document to add the land use control to the ROD**
- **Revised Final Remedial Action Completion Report submitted 22 Nov 2019**
- **If necessary, a technical conference call with regulatory agencies to resolve comments can be scheduled**

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**FORMER
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Site SS017
Old Pesticide/Paint Shop**

**BCT Conference Call
19 December 2019**



Site SS017 Groundwater Monitoring Update Path Forward

- **Q3 (Aug) 2018 data summary report submitted 12 Apr 2019 is under regulatory review**
- **Annual (Nov) 2018 groundwater report submitted 18 Apr 2019. Reissued hard copy reports on 30 Apr 2019. Report is under regulatory review.**
- **Draft Q2 (Jun) 2019 data summary report in production**
- **Draft Q3 (Aug) 2019 data summary report in production**
- **Q4 (Nov) 2019 sampling and land use control inspection completed**



Preliminary Groundwater Monitoring Summary

- **Dieldrin exceeded the EPA RSL of 0.0018 µg/L in MW02 at 0.060 µg/L dup (0.069 µg/L) (previous sample 0.380 and 0.330 µg/L) , in MW03 at 0.027 µg/L and in MW04 at 0.007 µg/L**
- **Chlordane exceeded the EPA RSL of 0.02 µg/L but not MCL of 2.0 µg/L in MW04 at 0.085 µg/L in MW03**
- **Endrin was detected at concentrations of 0.00054 JP and 0.00043 JP (duplicate) µg/L in MW02. The results were below the EPA RSL of 0.046 µg/L.**
- **4,4'-DDE was detected at concentrations of 0.0028 µg/L in MW03 and 0.00046 µg/L JP in MW04. and 0.00082 J (duplicate) µg/L. The results were below the EPA RSL of 0.046 µg/L.**



Parcel K-1-2 Property Transfer

- **Draft final FOST and SEBS including RTC to ADEQ comments posted for public comment. Comment period end 25 Mar 2019; no comments received.**
- **EPA comments received 11 Mar 2019**
- **Draft final FOST and SEBS issued to ASU for coordination**
- **FOST (final version in track changes responding to EPA comments) was issued via email for regulatory concurrence 24 Jul 2019 with follow up email 9 Aug 2019**
- **FOST clean copy with all revisions, responses to comment and ADEQ requested changes issued 15 Oct 2019**
- **Final FOST to be routed for AF signature after regulatory concurrence**
- **Draft DEUR and assignment package to be prepared**
- **Awaiting EPA concurrence; ADEQ concurrence received**

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**Site ST035
Former Building 760**

**BCT Conference Call
19 December 2019**



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ST035 Update

- **SVE system and enclosure decommissioning completed in July. ASU has indicated that the concrete pad, walls, and fencing will be retained for use by facilities management.**
- **Well abandonment activities complete on 22 Oct 2019. Documentation of well abandonment in preparation.**

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Site ST012***

**Former Liquid Fuel
Storage Area**

**BCT Conference Call
19 December 2019**



Site ST012 Outline

- **Summary of activities since Nov BCT call**
- **Quarterly update on SVE system**
- **LNAPL removal update**
- **Updated on benzene and sulfate concentrations**
- **Evaluation of potential biological testing locations**
- **Pilot study extraction/injection update**
- **Path forward**



Site ST012 Activities Since Nov

- Continued SVE operation
- LNAPL screening in select wells
- Operation of Extraction and Treatment
 - Pump Maintenance
 - Pneumatic extraction pumps continue to need cleaning and reinstallation (appears to be plugging of ball check valves)
 - Electrical issues on CZ21, UWBZ25, LSZ23, and LSZ43 (driller scheduled for 18-19 Dec)
 - Arranging for extraction at W36
 - Arranging for swabbing/development of LSZ37 due to decreased sulfate (may want to restart extraction)
 - Treatment System Maintenance
 - Removed static mixer due to corrosion and replaced with pipe. No apparent effect on effectiveness of scale and bio-control chemicals.
- Sodium sulfate injections (detail on later slides)





SVE Update



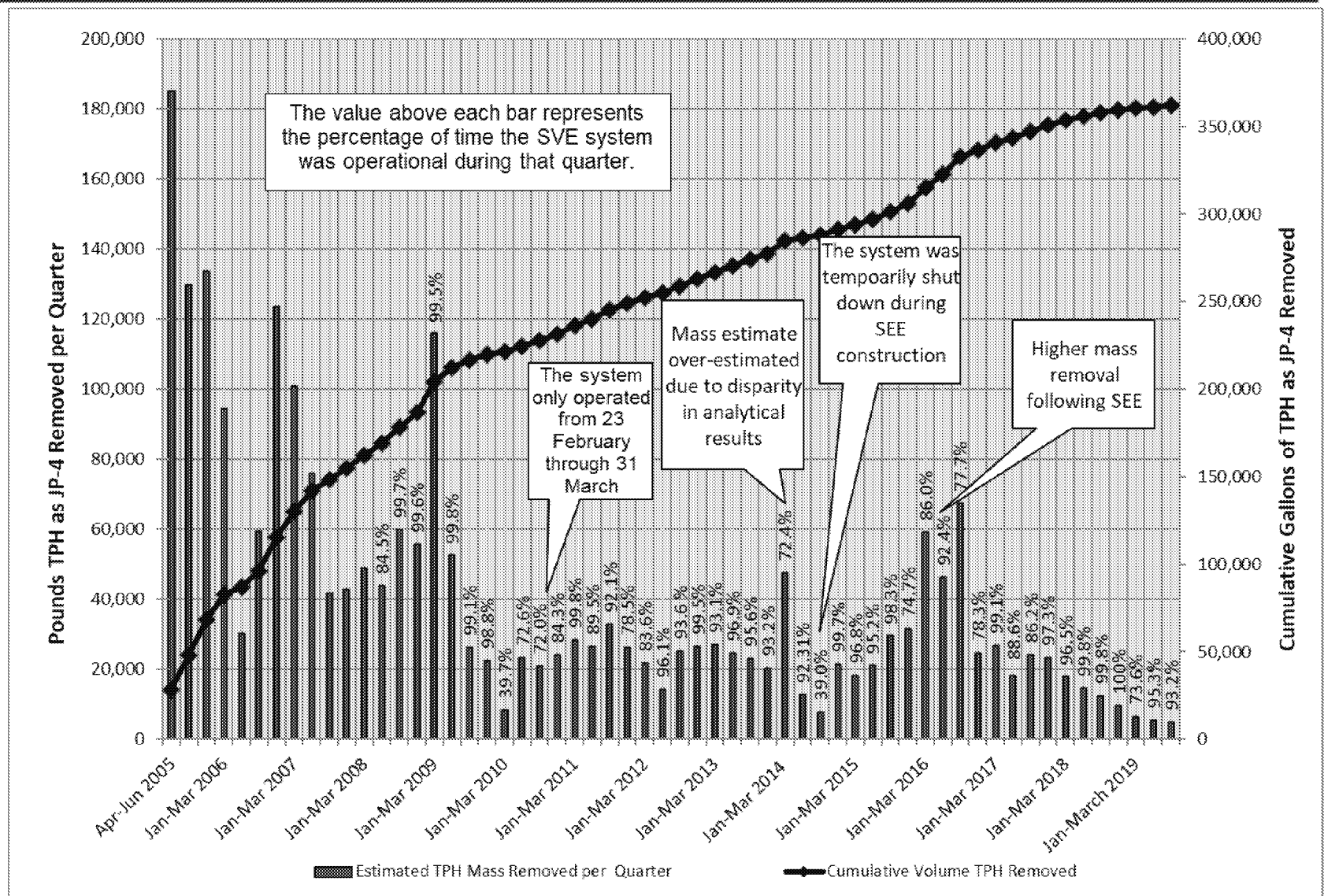
Site ST012 SVE System Update

- **Jul – Sep 2019**
 - 93.18% operational uptime CAT2
 - Total petroleum hydrocarbon (TPH) removed – 5,059 pounds or 770 gallons



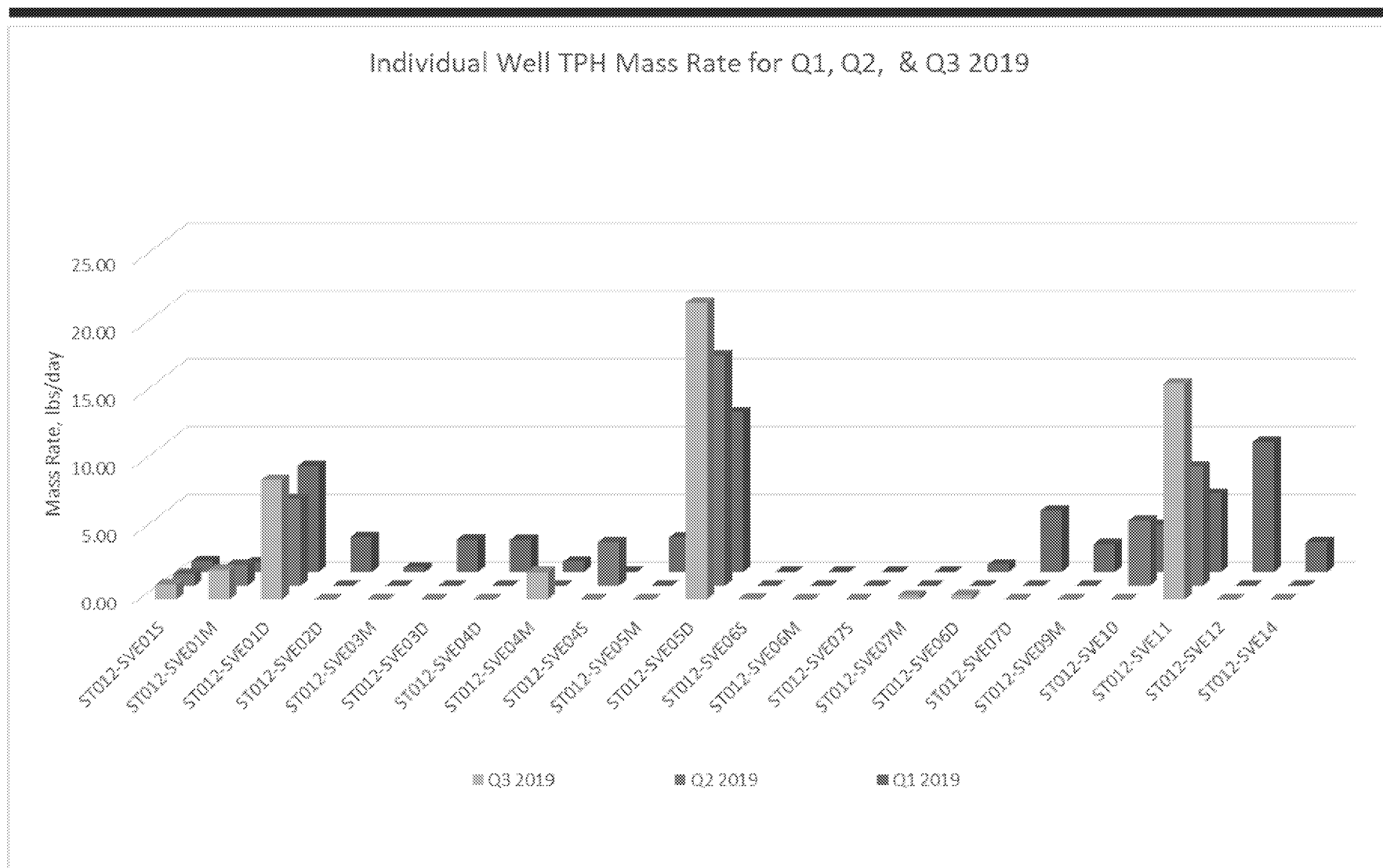


Site ST012 SVE System Performance





Site ST012 SVE System Performance

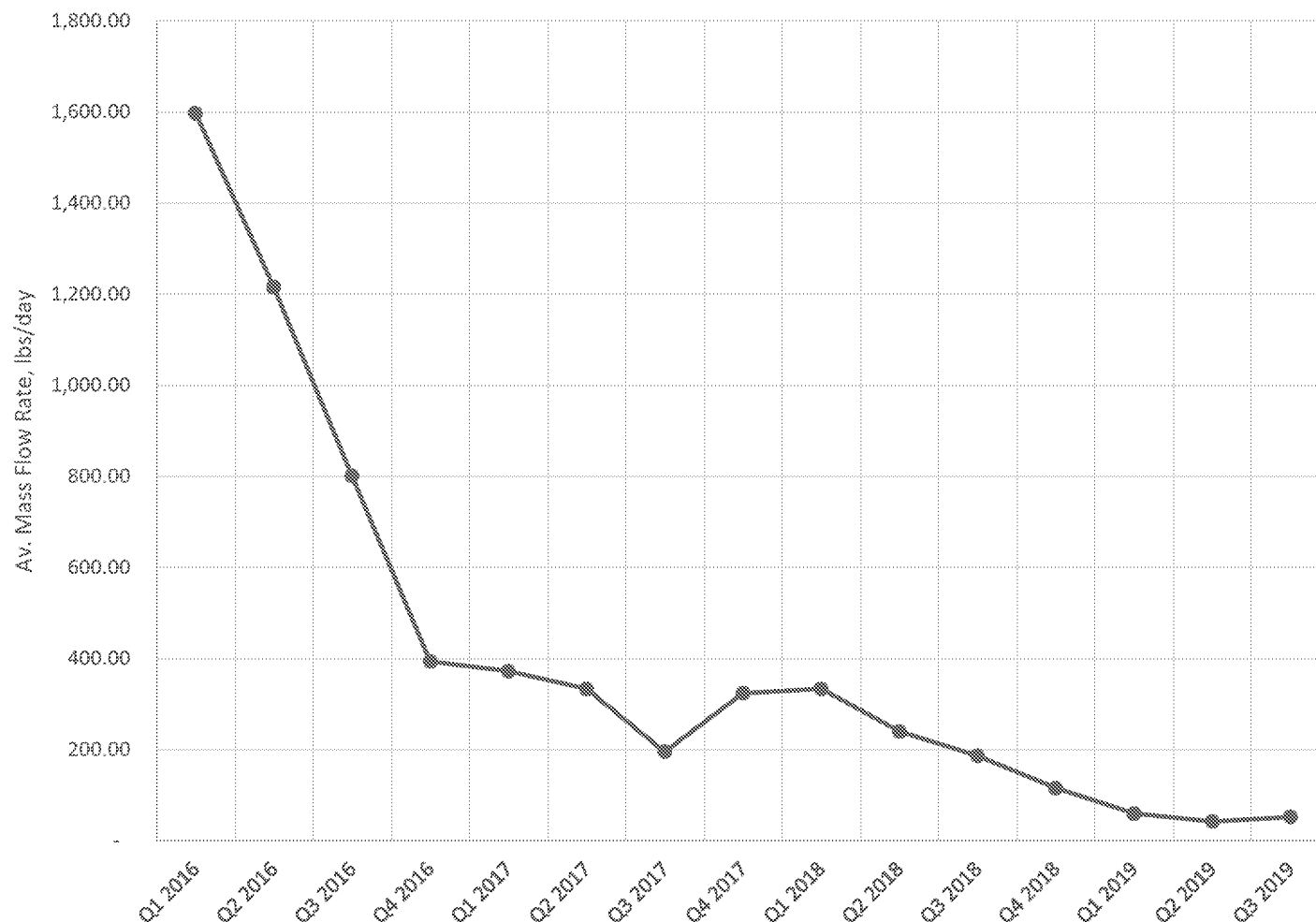


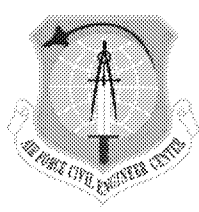
*Sulfate injection pipe installed in SVE04D and flow meter removed. Flow rate averaged based on wellhead vacuum.



Site ST012 SVE System Performance

Total TPH Mass Rate from All SVE Wells for Q1 2016 - Q3 2019

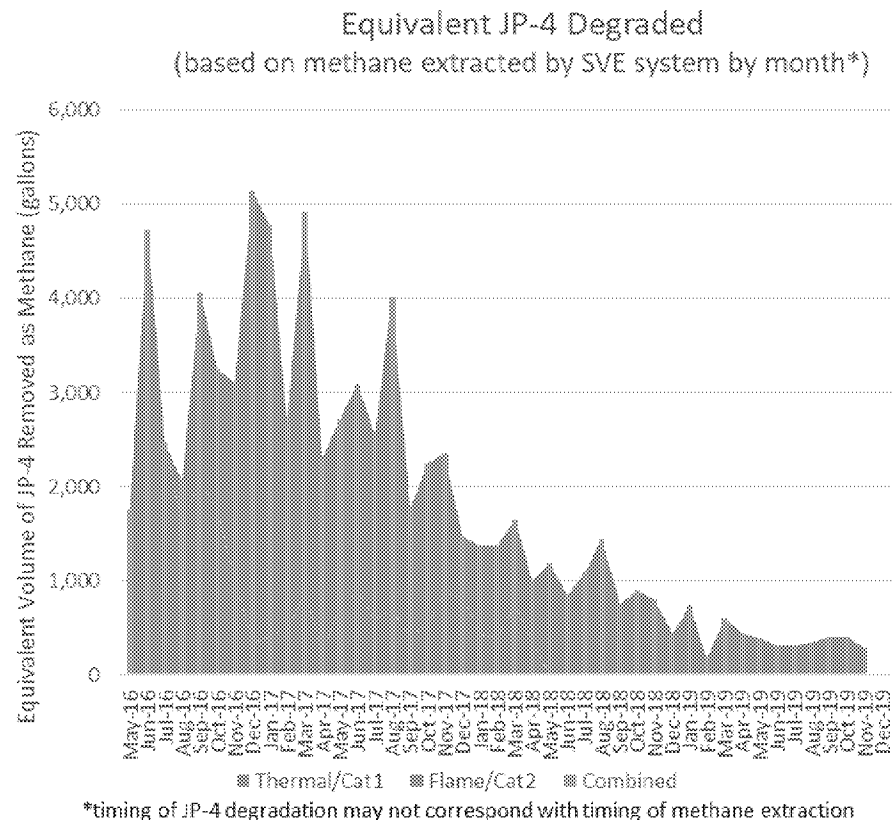
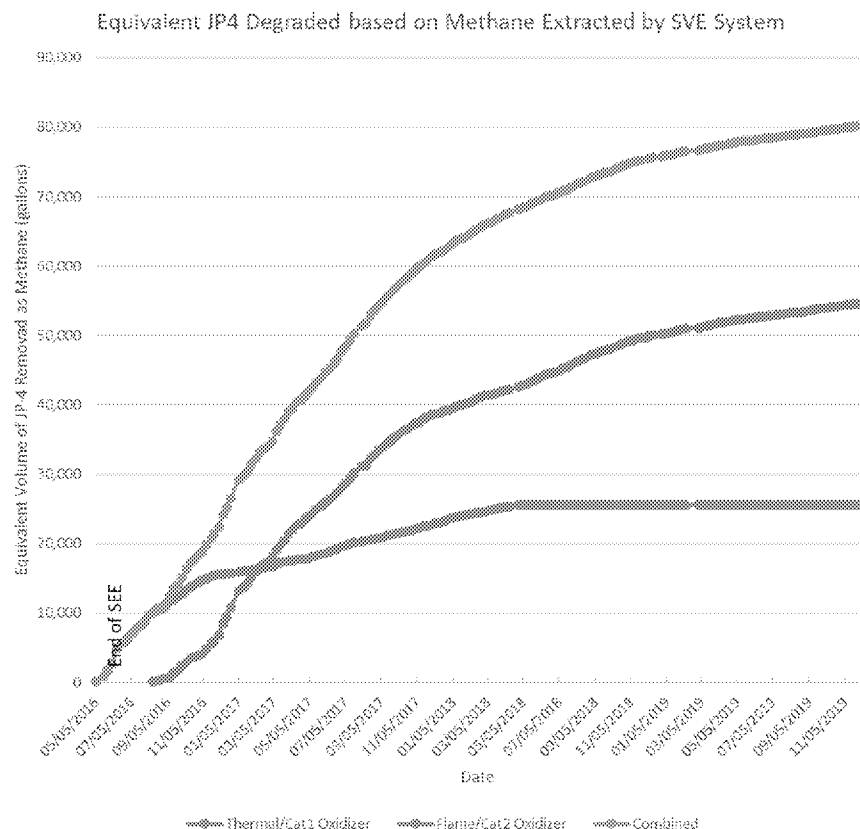




JP-4 Degradation Based on Methane Removed with SVE



Site ST012 SVE System Equivalent JP-4 Degradation Based on Methane Removed



- Estimates through 05 Dec 2019
- Estimated JP-4 degradation as methane is in addition to JP-4 removal reported for SVE
- Thermal/Cat1 oxidizer changed from SVE to groundwater treatment end of Apr (low methane concentrations recently observed but attributed to vapor bleed through closed valve from SVE)
- Flame oxidizer treating combined SVE and air stripper intermittently in Nov 2018 – Jan 2019
- Flame oxidizer replaced by catalytic oxidizer (Cat2) 7 Feb to 26 Feb 2019

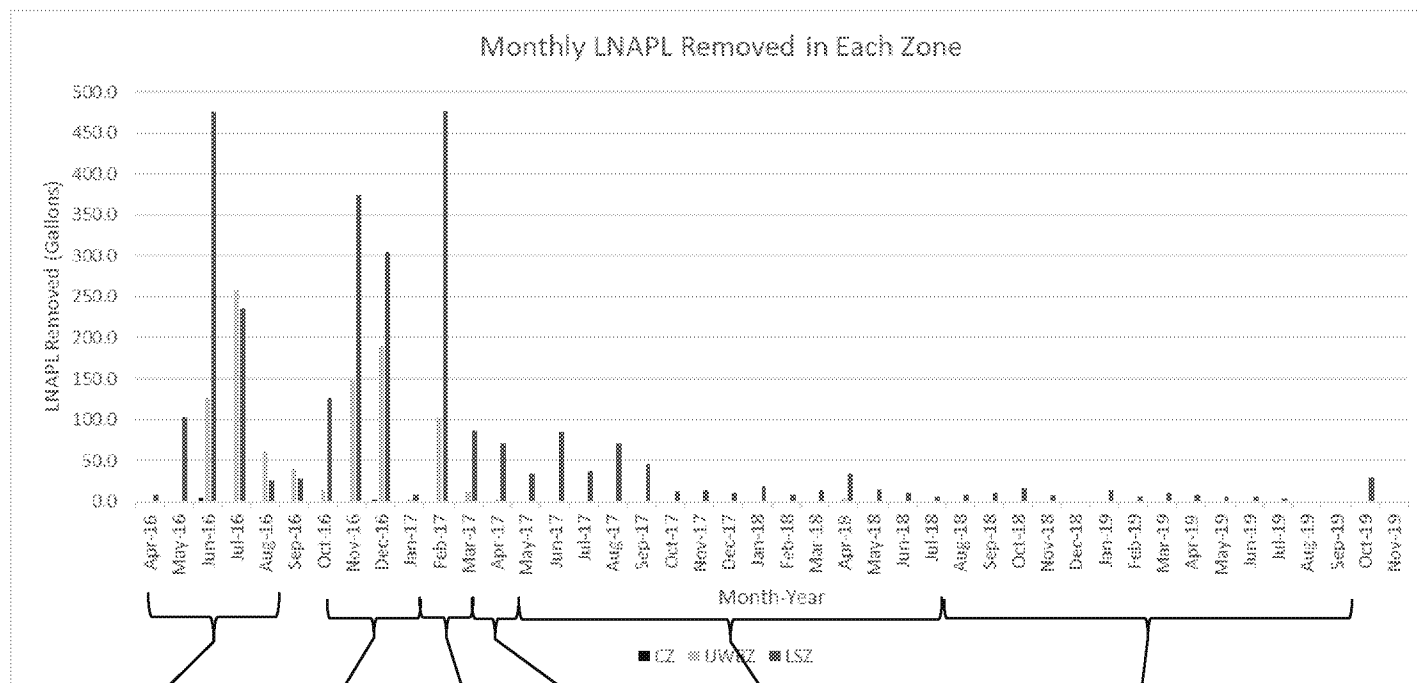


LNAPL Removal Update (through 26 Nov)



ST012 LNAPL Removal Summary

- CZ – 7.5 gallons of LNAPL removed. 0.5 Gallons removed since Nov 2016 (CZ18).
- UWBZ – 963 gallons of LNAPL removed. None since Apr update.
- LSZ – 2,874 gallons of LNAPL removed. 0.5 Gallons removed since Oct update. (LSZ36)



Removal following initial eductor removals

Removal following remaining eductor removals

Diminished removal due to pump failure

Recovery following pump replacement

<100 gal/mo

<20 gal/mo



Preliminary Fourth Quarter Groundwater Sampling Results

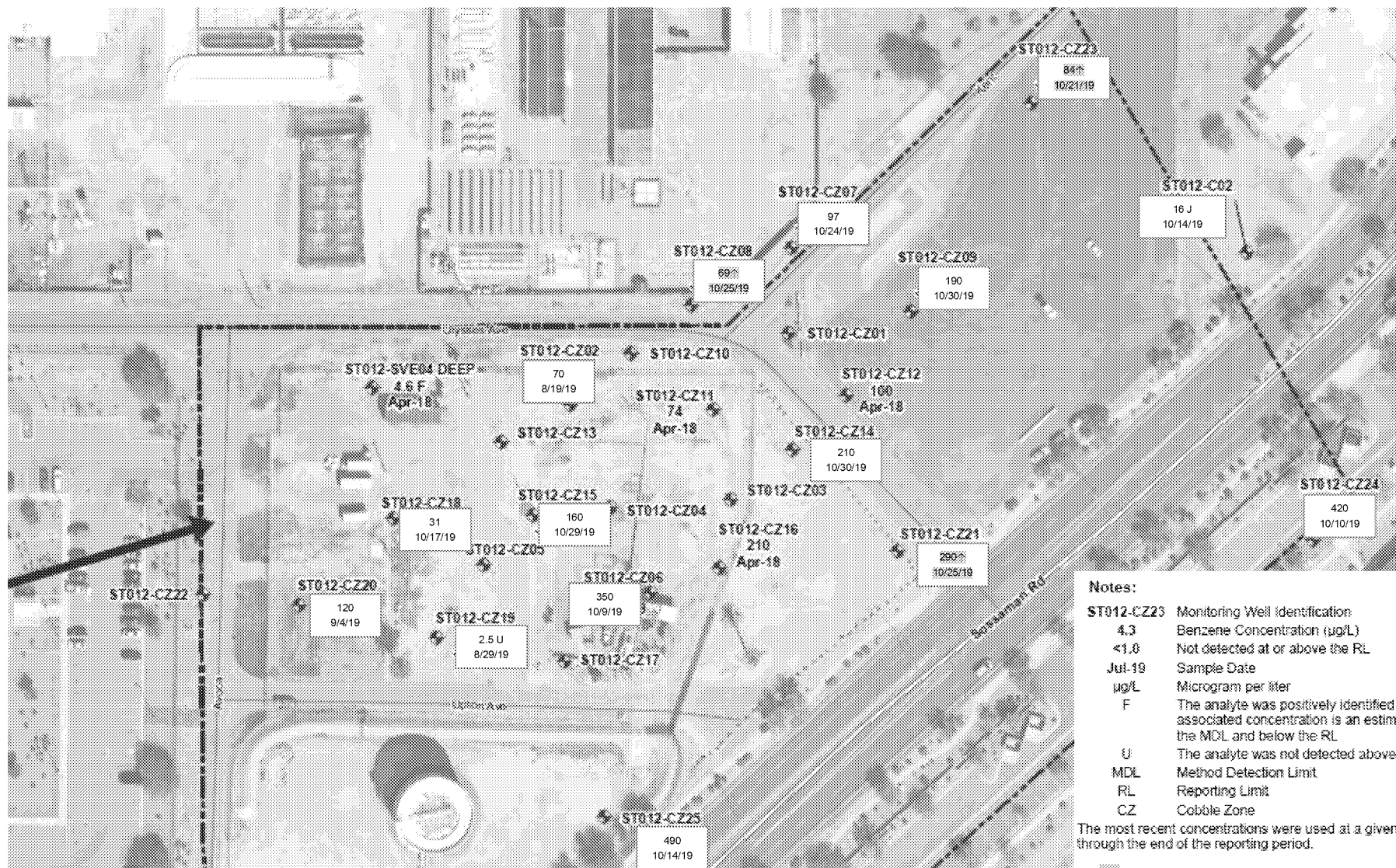


Sampling Summary

- **Sampling includes:**
 - Extraction Wells
 - Injection Wells (where injections took place)
 - Monitoring Wells (in areas where injections took place)
 - Perimeter Wells
- **General Observations**
 - Benzene at CZ23 continues to be below 5 µg/L
 - Benzene at perimeter well LSZ54 not detected in resample
 - Benzene at perimeter well U02 at 41 µg/L in October sample and 39 µg/L in November resample

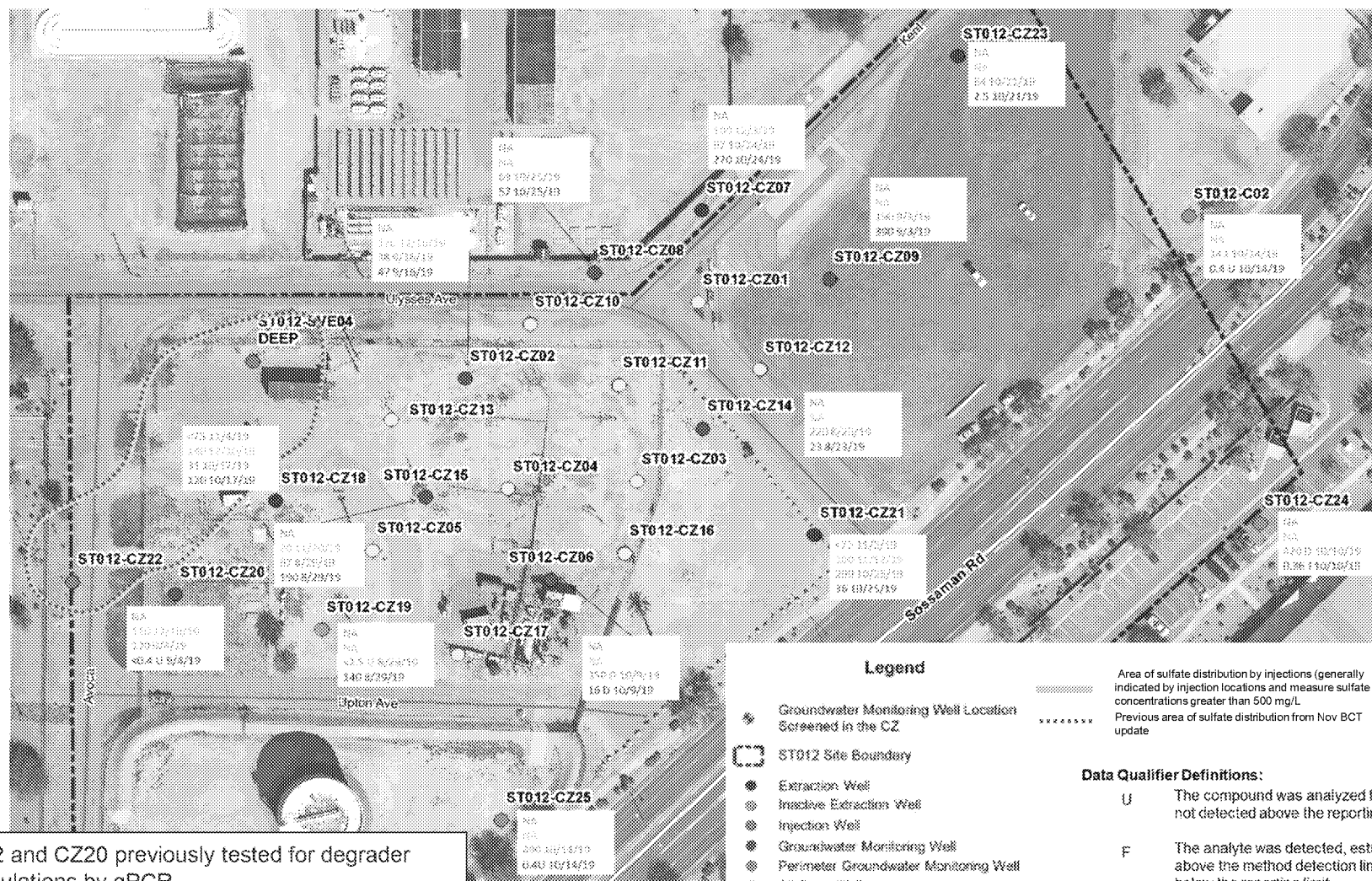


Site ST012 Sulfate (mg/L) in CZ





EBR Treatment Area in CZ

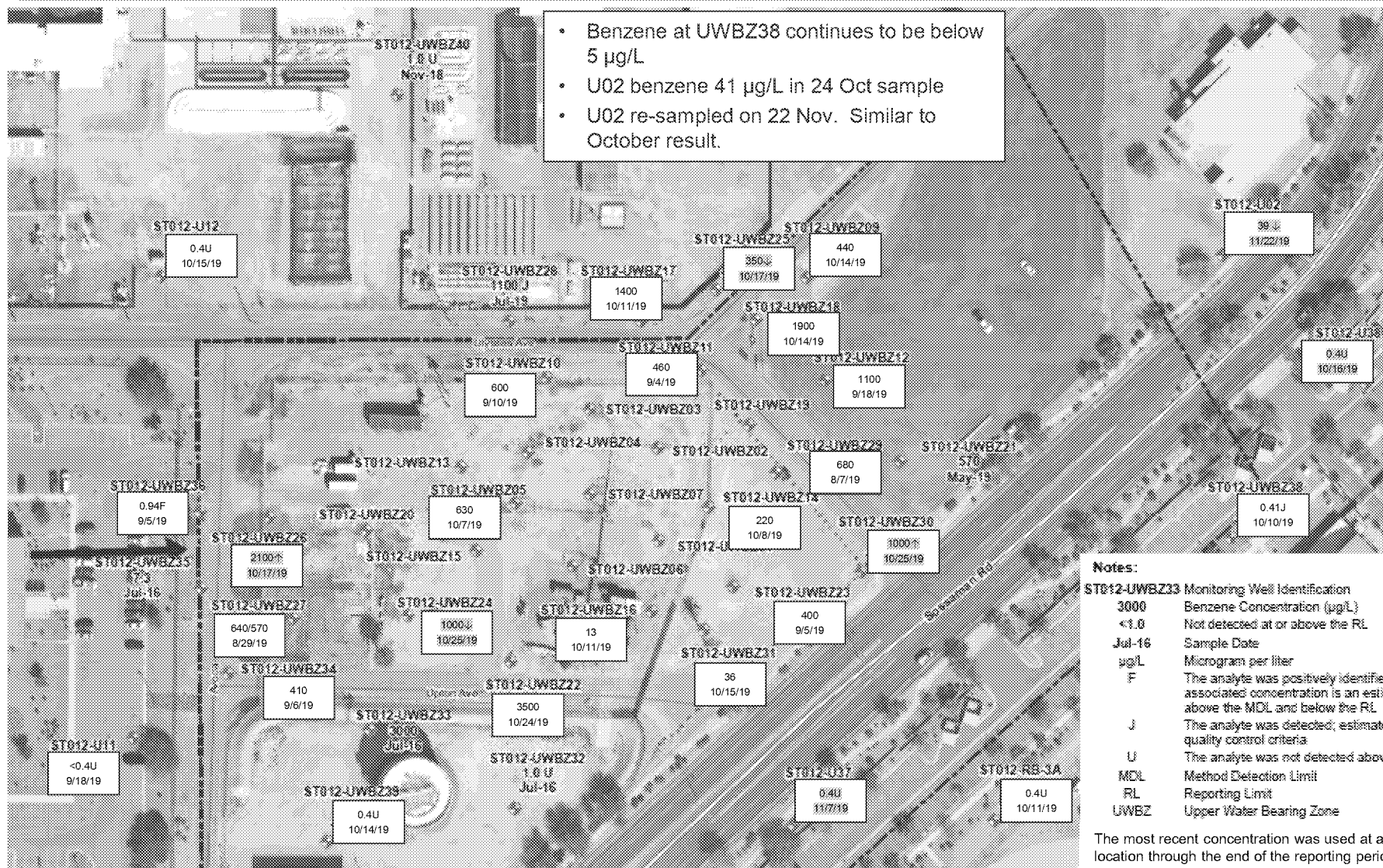


- C02 and CZ20 previously tested for degrader populations by qPCR
- CZ18 sulfate concentrations went down



Site ST012 Benzene ($\mu\text{g/L}$) in UWBZ

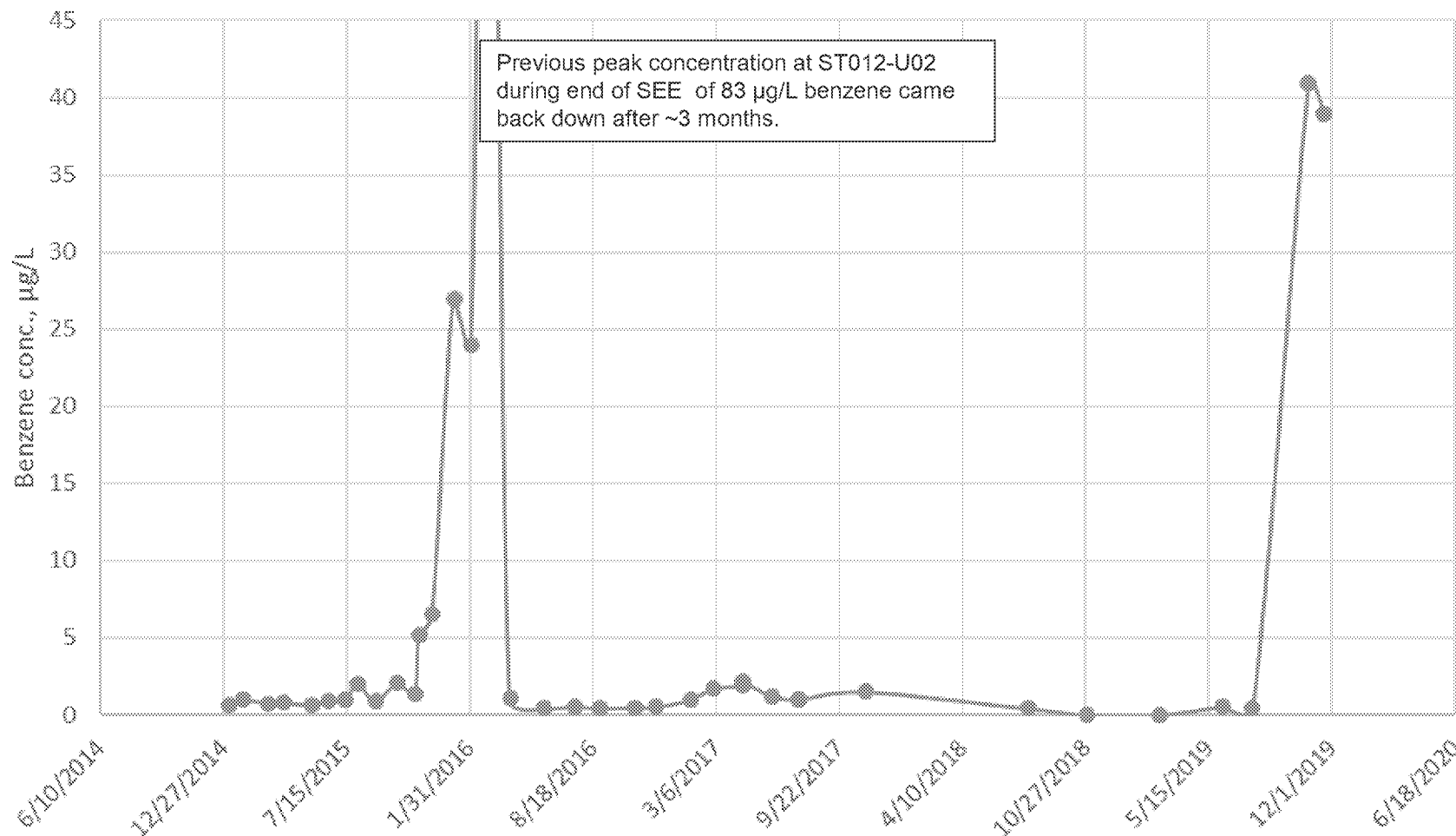
- Benzene at UWBZ38 continues to be below 5 $\mu\text{g/L}$
- U02 benzene 41 $\mu\text{g/L}$ in 24 Oct sample
- U02 re-sampled on 22 Nov. Similar to October result.





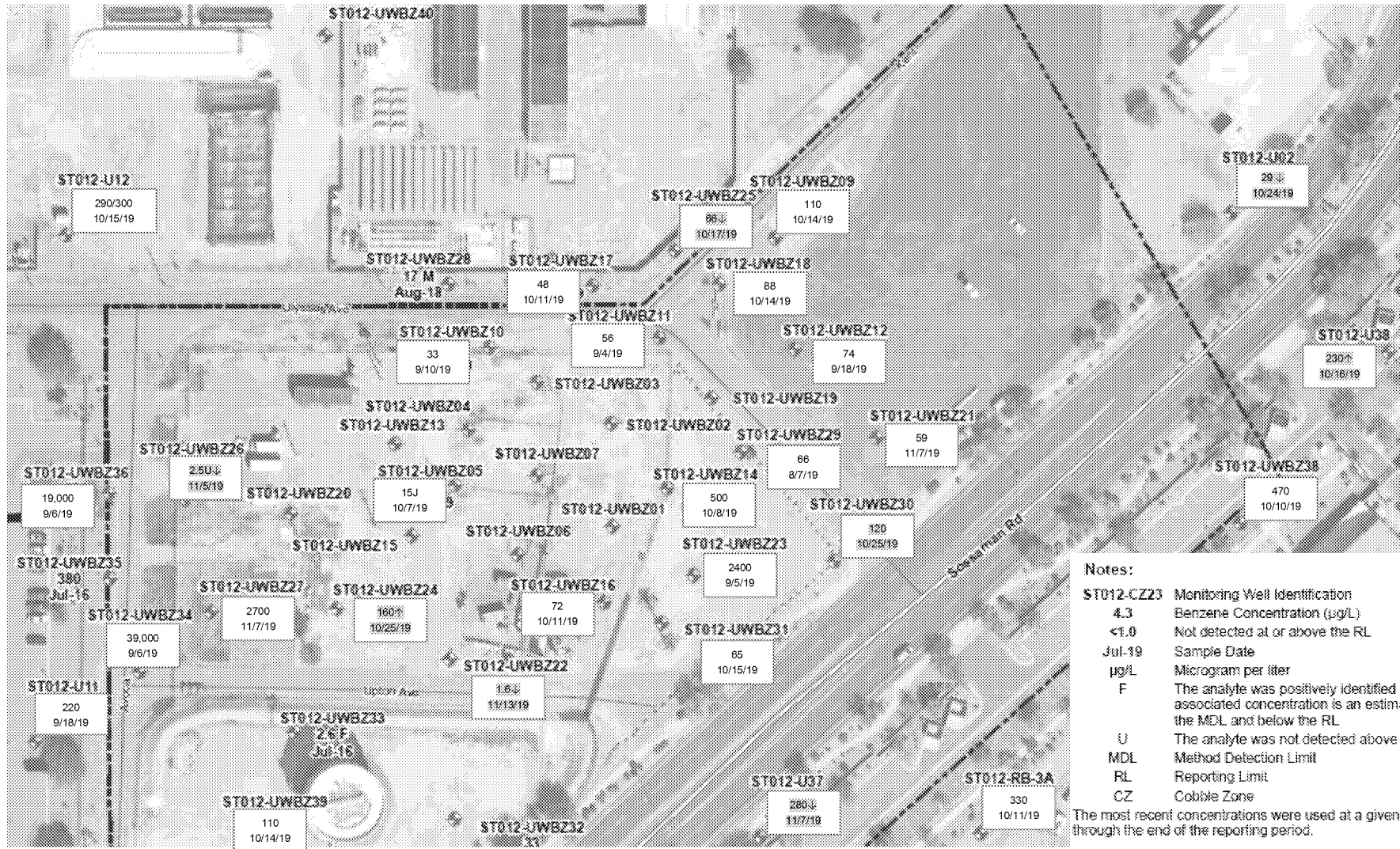
Site ST012 U02 Historical Benzene Concentration

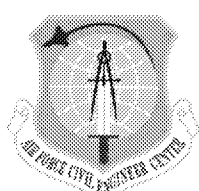
U02 Historical Benzene Concentrations





Site ST012 Sulfate (mg/L) in UWBZ





EBR Treatment Areas in UWBZ

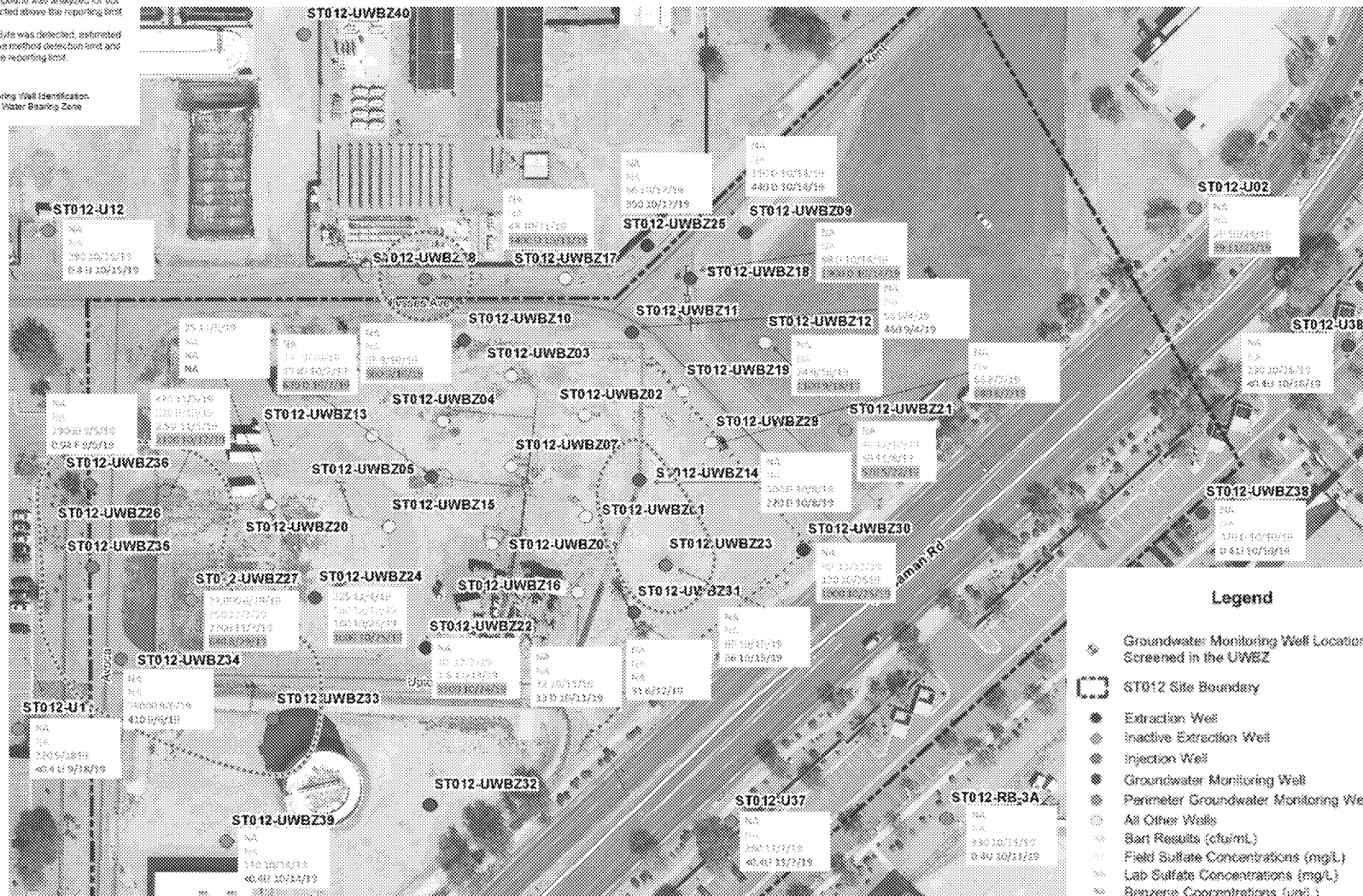
Area of sulfate distribution by injections (generally indicated by injection locations and measure sulfate concentrations greater than 500 mg/L)
Previous area of sulfate distribution from Nov BCT update

Data Qualifier Definitions:

- The compound was analyzed for but not detected above the reporting limit
- The analyte was detected, estimated above the method detection limit and below the reporting limit.

Notes:
ST012-UWBZ14 Monitoring Well Identification
UWBZ Upper Water Bearing Zone

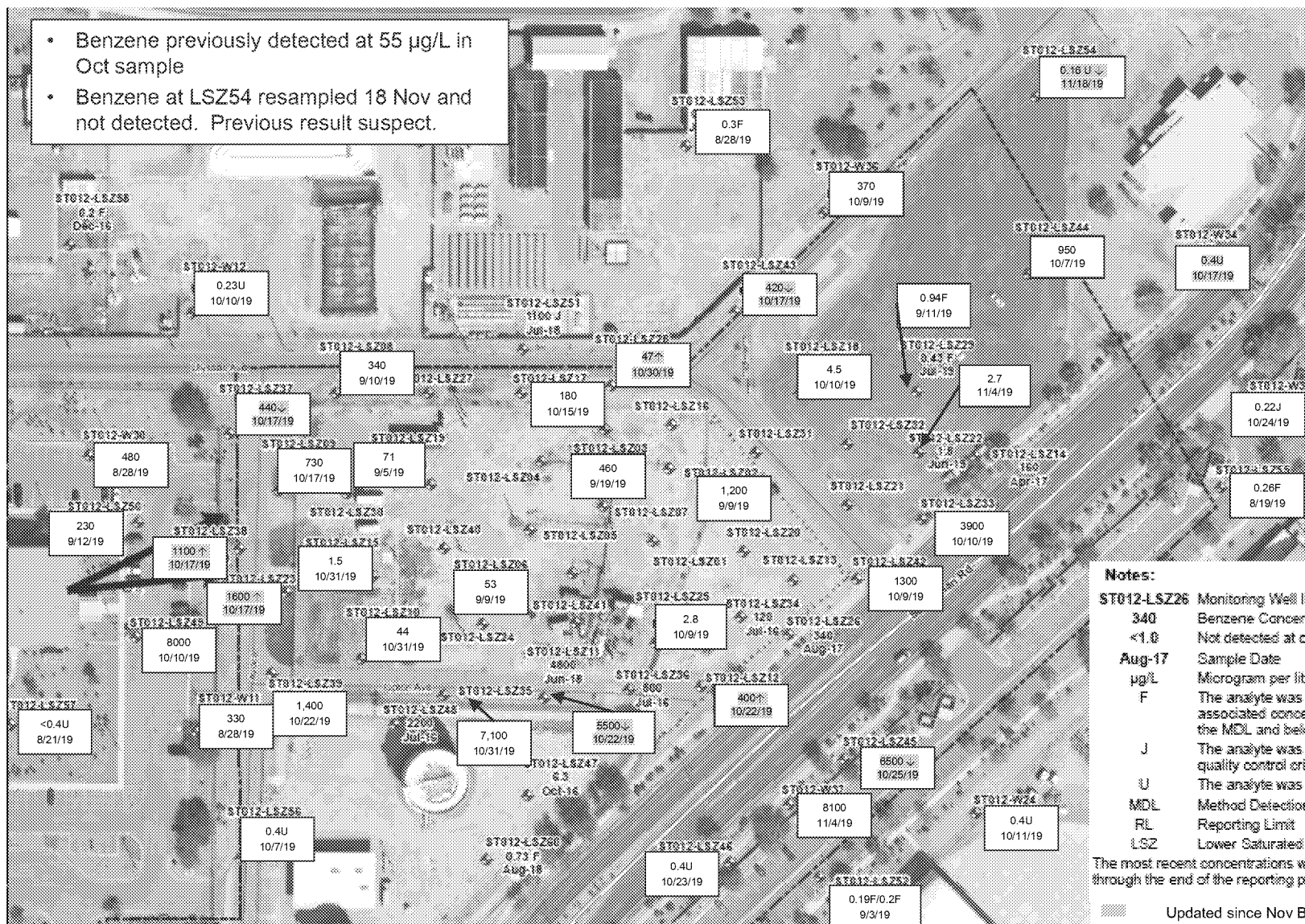
- UWBZ24 and UWBZ31 previously tested for degrader populations by qPCR





Site ST012 Benzene (mg/L) in LSZ

- Benzene previously detected at 55 µg/L in Oct sample
- Benzene at LSZ54 resampled 18 Nov and not detected. Previous result suspect.



Notes:

ST012-LSZ26 Monitoring Well Identification

340 Benzene Concentration (µg/L)

<1.0 Not detected at or above the RL

Aug-17 Sample Date

µg/L Microgram per liter

F The analyte was positively identified but the associated concentration is an estimation above the MDL and below the RL

J The analyte was detected; estimated due to quality control criteria

U The analyte was not detected above the RL

MDL Method Detection Limit

RL Reporting Limit

LSZ Lower Saturated Zone

The most recent concentrations were used at a given location through the end of the reporting period.

Updated since Nov BCT update (arrow indicates direction of change from previous result)

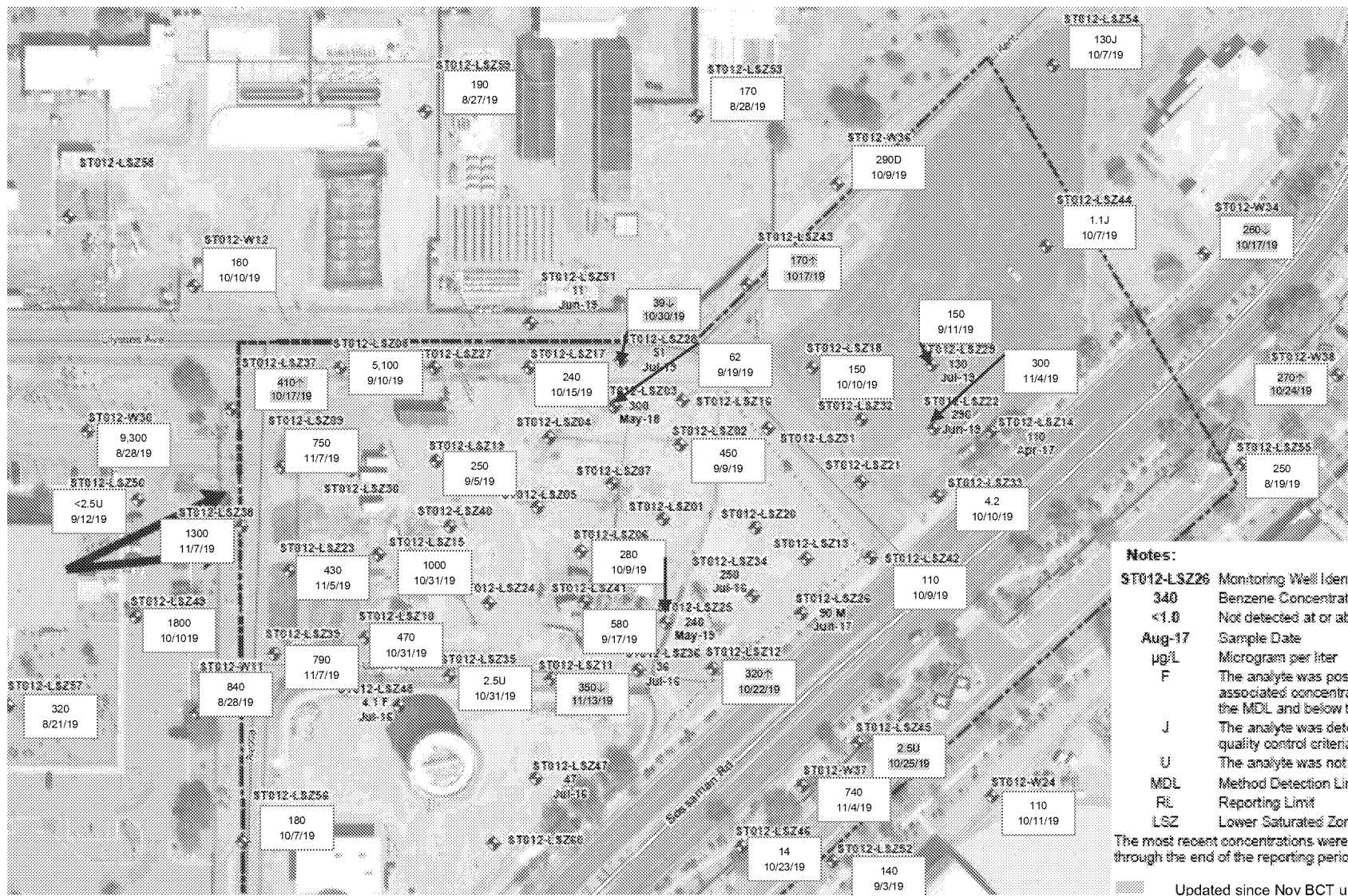
19 December 2019

33

ED_005025_00009834-00033



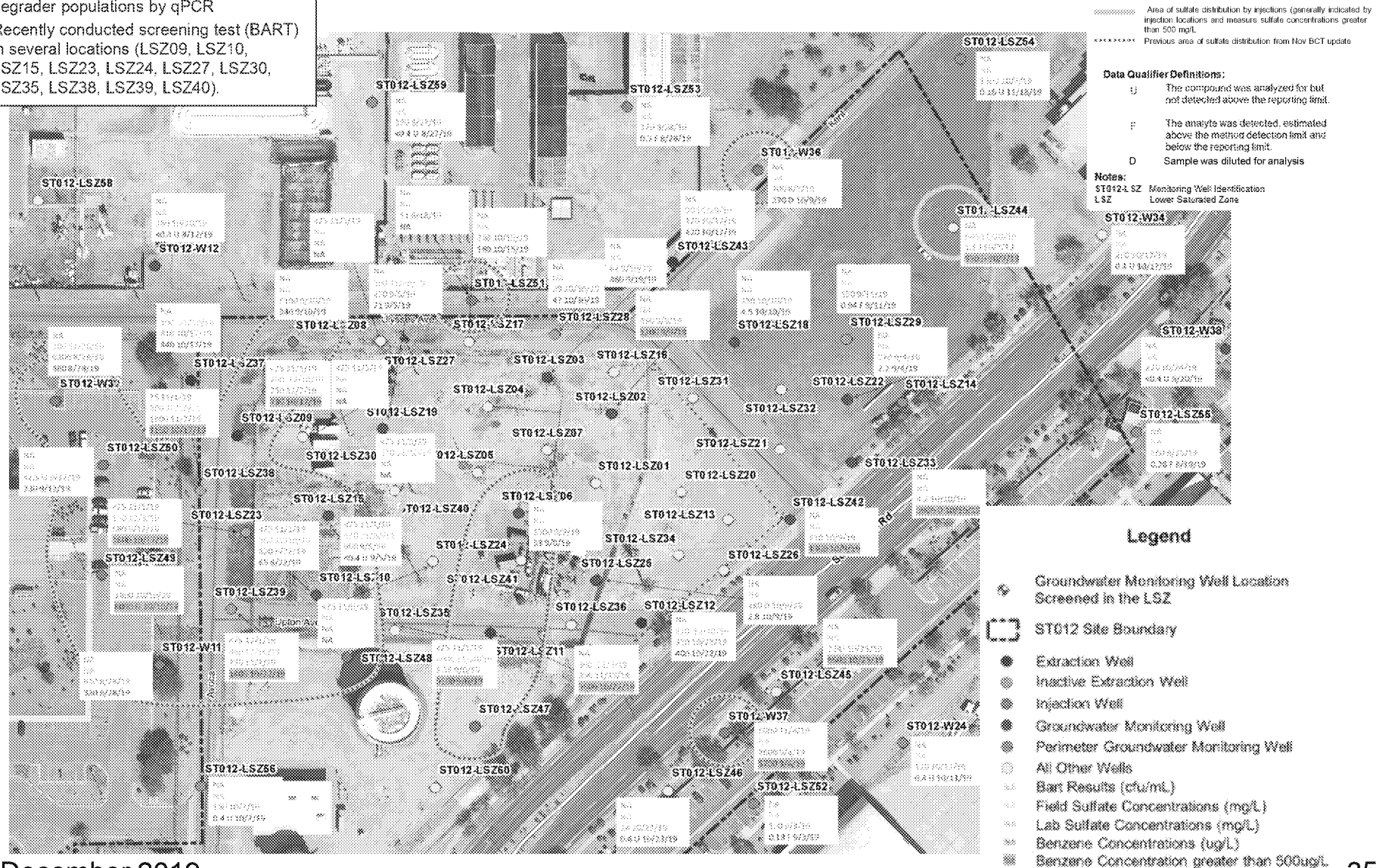
Site ST012 Sulfate (mg/L) in LSZ





EBR Treatment Areas in LSZ

- LSZ10 and LSZ42 previously tested for degrader populations by qPCR
- Recently conducted screening test (BART) in several locations (LSZ09, LSZ10, LSZ15, LSZ23, LSZ24, LSZ27, LSZ30, LSZ35, LSZ38, LSZ39, LSZ40).





Site ST012 Potential Biological Testing Locations

- Evaluation presented in Nov BCT call for well locations for potential biological testing
- BART retest samples collected on 16 Dec 2019
 - CZ18
 - UWBZ24
 - UWBZ27
 - LSZ09
 - LSZ10
 - LSZ15
 - LSZ24
 - LSZ27
 - LSZ38
 - LSZ39
 - W37
- Testing in progress
- Expect to deploy BioTraps® in January



Pilot Study Injection/Extraction Update



Site ST012 Extraction System Performance

Extraction System Status Summary

Extraction Well	Calculated Average Extraction Rate in Period gpm	Maximum Temperature °F	Most Recent Temperature °F	Cumulative Extraction gallons	Note
ST012-CZ07	6.0	175	144	4,252,306	
ST012-CZ18	Off	136	126	3,019,867	Extraction stopped due to sulfate presence (Oct 2019)
ST012-CZ19	NA				Eliminated as an extraction well by FVM#7
ST012-CZ21	0.3	150	110	452,498	Totalizer reading suspect
ST012-CZ23	2.5	105	105	465,552	
CZ Subtotal				8,190,224	
ST012-UWBZ21	0.0	162	105	591,514	Pneumatic pump, currently down
ST012-UWBZ22	0.03	146	125	466,901	Totalizer reading suspect
ST012-UWBZ25	5.8	168	168	199,490	
ST012-UWBZ26	Off	133	114	2,408,709	Extraction stopped due to sulfate presence (Sep 2019)
ST012-UWBZ27	Off	128	94	130,009	Extraction stopped due to sulfate presence (May 2019)
ST012-UWBZ30		172	65	1,397,243	Pneumatic pump, pumping intermittently, counter suspect
UWBZ Subtotal*				6,462,299	
ST012-LSZ09	Off	140	130	2,748,461	Extraction stopped due to sulfate presence (Oct 2019)
ST012-LSZ11	3.3	139	98	4,337,708	
ST012-LSZ12	4.5	130	100	1,964,822	Pump down, electrical issue
ST012-LSZ23	Off	113	94	3,638,934	Extraction stopped due to sulfate presence (Aug 2019)
ST012-LSZ28	NA	162		18,899	Eliminated as an extraction well by FVM#7
ST012-LSZ29	NA	>170		17	Eliminated as an extraction well by FVM#7
ST012-LSZ37	Off	132	90	6,274,757	Extraction stopped due to sulfate presence (Oct 2019)
ST012-LSZ38	Off	160	90	941,898	Extraction stopped due to sulfate presence (Aug 2019)
ST012-LSZ39	Off	92	78	1,250,933	Extraction stopped due to sulfate presence (May 2019)
ST012-LSZ43	3.5	140	121	441,689	
ST012-UWBZ28/LSZ51	NA	146	128	2,536,868	Extraction stopped (Aug 2019), changed to injection end of subphase 2
LSZ Subtotal*				22,886,553	
Total of Wells	25.9			37,539,075	
Treatment System	10.5			27,666,427	

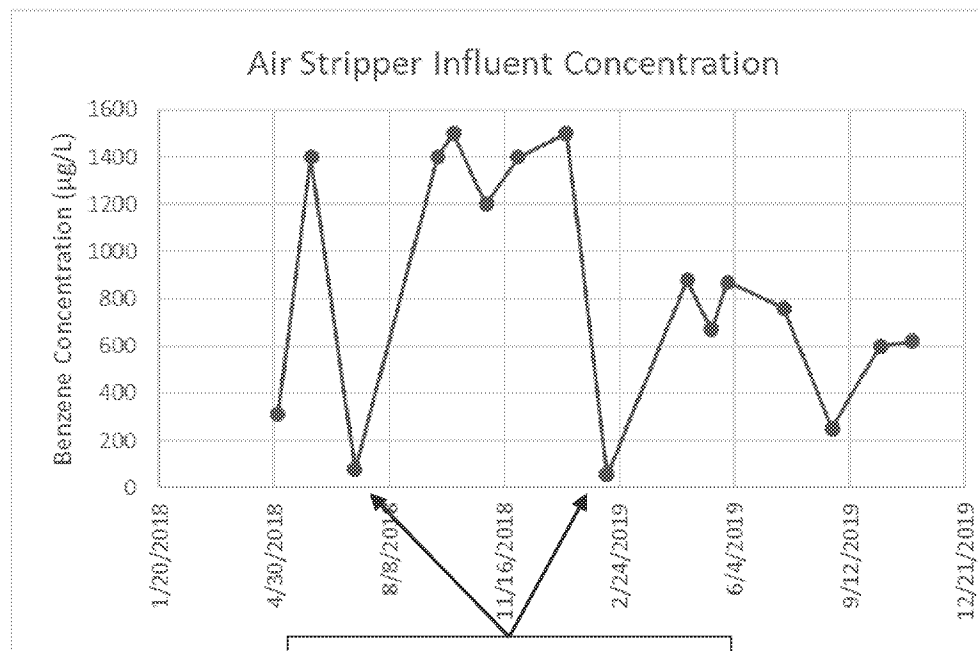
Data is preliminary

* Includes 1/2 of ST012-UWBZ28/LSZ51



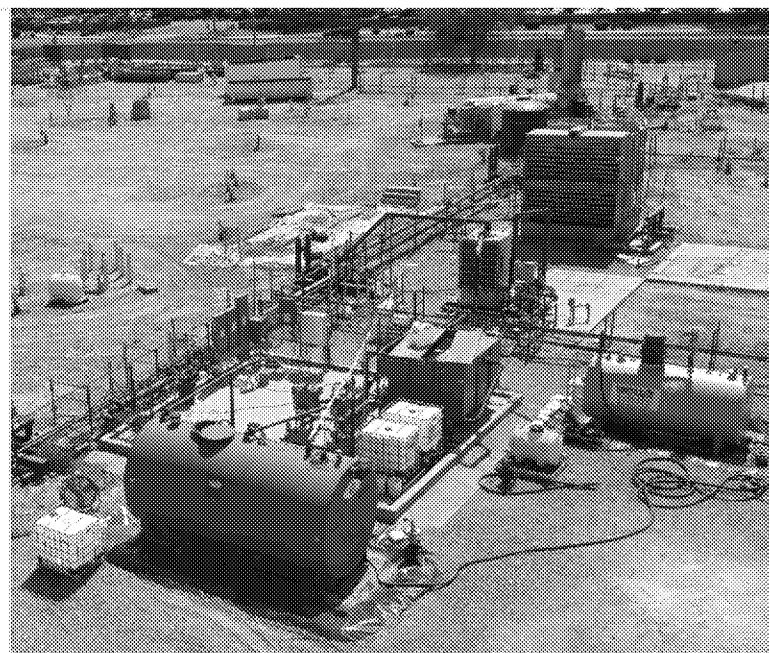
Site ST012 Extraction System Performance

- No LNAPL has been recovered since extraction started up
- Extraction pumps CZ21, UWBZ25, LSZ23, LSZ43 currently down
- CZ18, UWBZ21, UWBZ26, UWBZ27, LSZ09, LSZ23, LSZ37, LSZ38, and LSZ39 turned off due to sulfate presence
- Benzene air stripper influent at 620 $\mu\text{g/L}$ for November sample



9 Jul 2018 sample considered an outlier and not included in mass removal calculations.

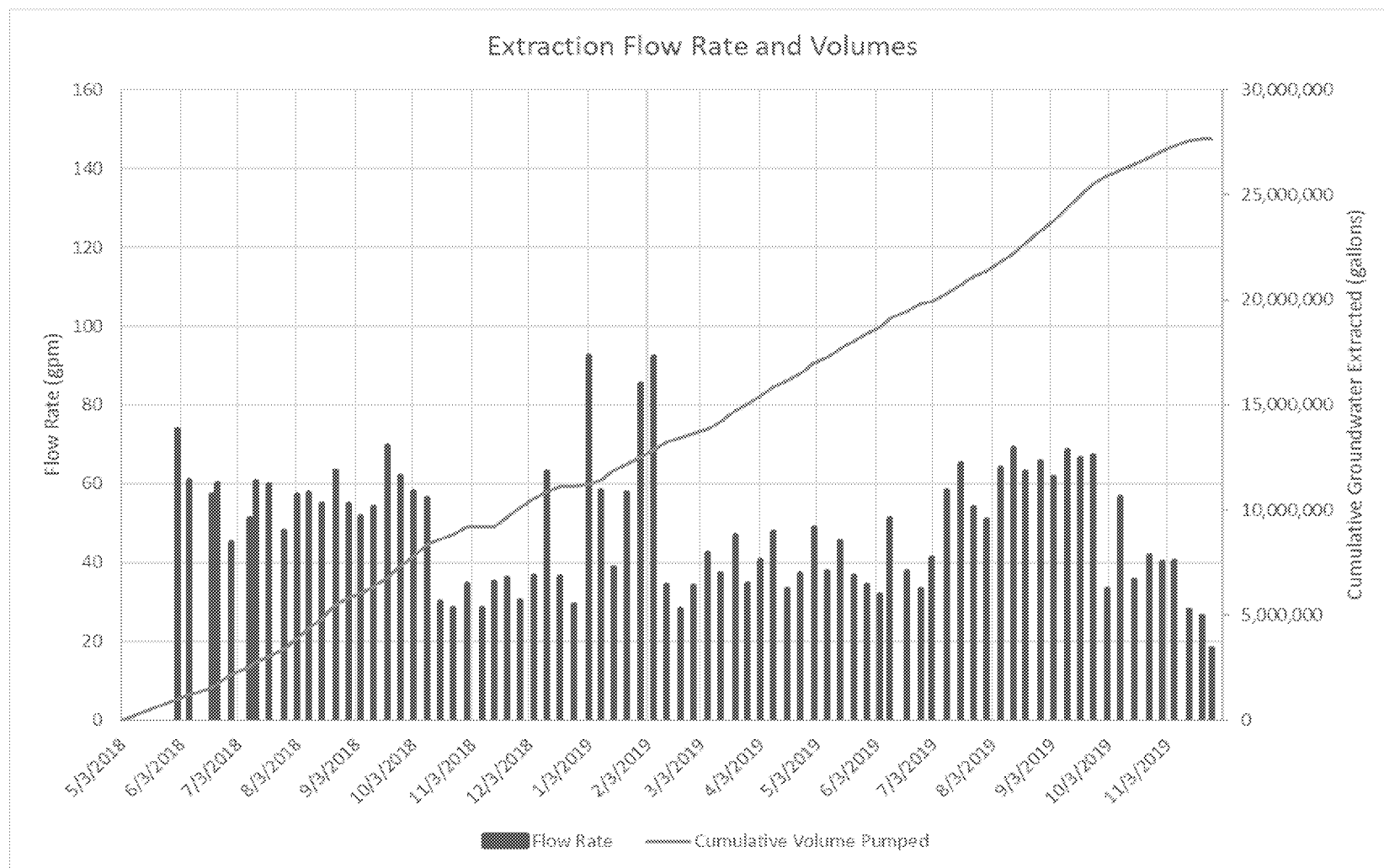
Low result again in February





Site ST012 Extraction System Performance

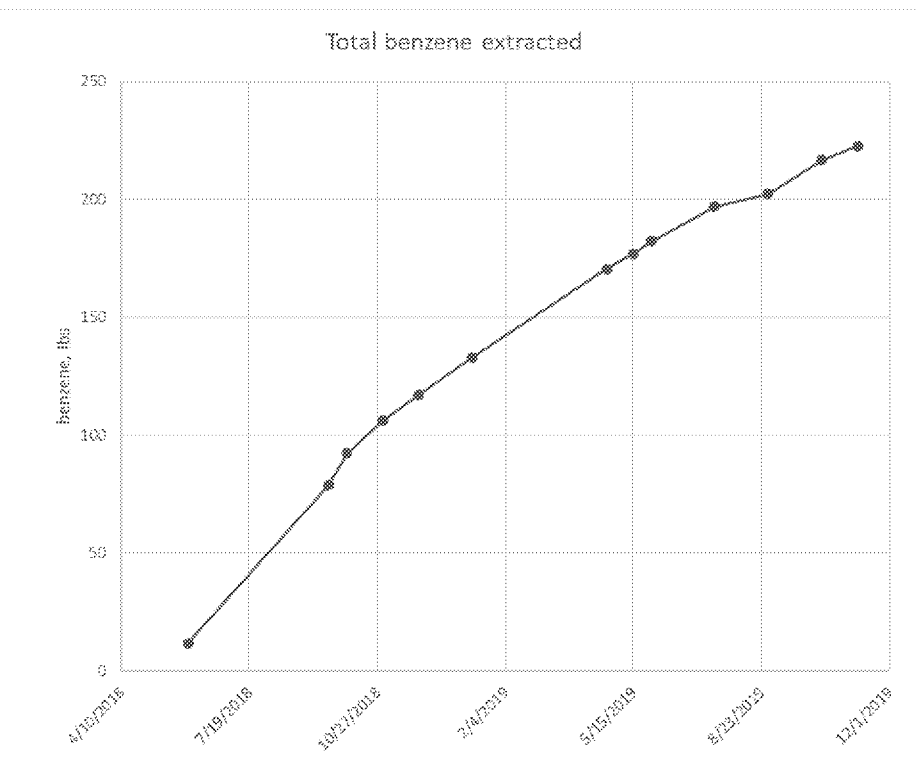
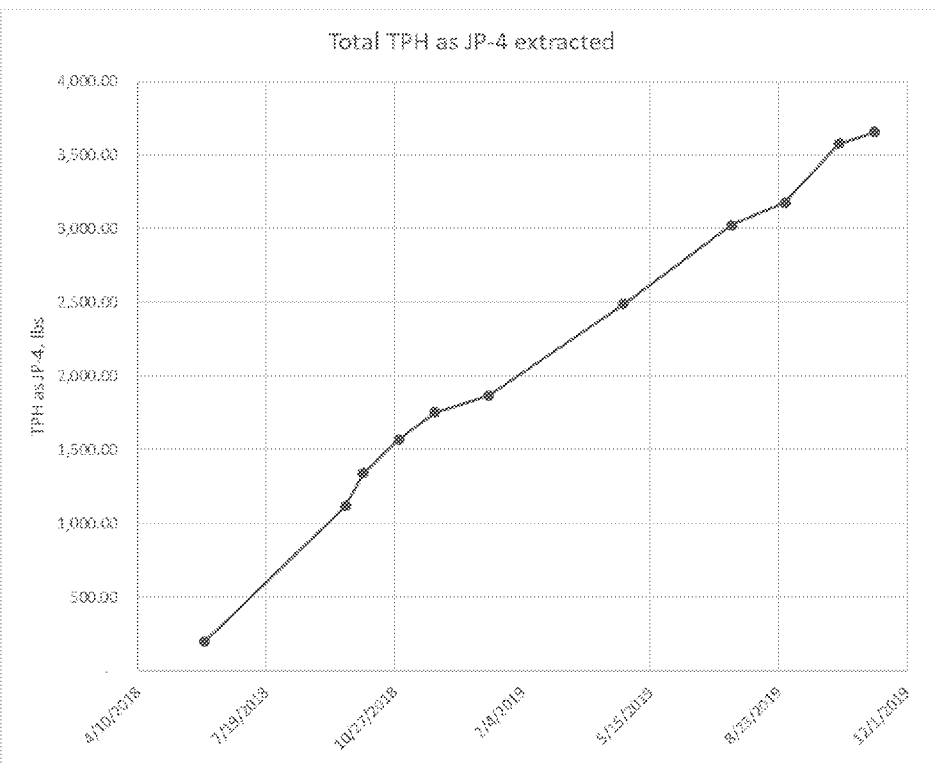
- Overall Extraction Rates and Cumulative Volume Extracted





Site ST012 Extraction System Performance

- Estimated Mass Removal by Extraction





Site ST012 Injection Progress

- **Injections continued in November**
- **429 tons injected through 27 Nov 2019**
- **57 tons injected since last update**
- **Subphase 3 injections ongoing and will continue through Dec**

Date	Volume (gallons)	Number of Bags of Sulfate Added	Calculated Na2SO4 Conc. g/L	Calculated SO4 Conc. g/L	Locations(% of volume if multiple locations)
10/31/2019	4000	2	113	76	UWBZ33 (0.8 tons) UWBZ34 (0.7 tons)
11/1/2019	8000	4	113	76	UWBZ33 (0.8 tons) UWBZ35 (1.8 tons) UWBZ34 (1.8 tons)
11/4/2019	8000	4	113	76	UWBZ33 (1.2 tons) UWBZ35 (1.7 tons) UWBZ34 (1.7 tons) UWBZ36 (1.7 tons)
11/5/2019	8000	4	113	76	UWBZ33 (1.5 tons) UWBZ36 (2.2 tons) W11 (1.3 tons)
11/6/2019	8000	4	113	76	UWBZ33 (4.5 tons) UWBZ36 (2.6 tons) W11 (1.5 tons)
11/7/2019	8000	4	113	76	UWBZ33 (2.2 tons) UWBZ36 (1.5 tons) W11 (4.6 tons)
11/8/2019	8000	4	113	76	UWBZ36 (0.8 tons)
11/13/2019	6000	3	113	76	UWBZ36 (0.4 tons) W11 (3.0 tons)
11/14/2019	8000	4	113	76	UWBZ36 (2.0 tons) W11 (3.2 tons)
11/15/2019	8000	4	113	76	UWBZ36 (1.7 tons) W11 (2.6 tons)
11/18/2019	8000	4	113	76	UWBZ36 (0.6 tons) W11 (1.5 tons) LSZ47 (1.5 tons)
11/19/2019	4000	2	113	76	UWBZ36 (1.0 tons) W11 (1.2 tons)
11/21/2019	8000	4	113	76	W11 (3.3 tons) LSZ47 (1.7 tons)
11/22/2019	4000	2	113	76	LSZ47 (1.3 tons)
11/25/2019	8000	4	113	76	LSZ47 (1.5 tons) LSZ49 (2.2 tons)
11/26/2019	8000	4	113	76	LSZ49 (3.5 tons)
11/27/2019	6000	3	113	76	LSZ47 (0.5 tons) LSZ49 (2.0 tons)



Site ST012 Sulfate Field Screening

Date	Sulfate Concentration (mg/L)																							
	CZ02	CZ18	CZ07	CZ20	CZ21	UWBZ15	UWBZ21	UWBZ22	UWBZ24	UWBZ26	UWBZ27	UWBZ28/LSZ51	UWBZ30	LSZ09	LSZ10	LSZ11	LSZ12	LSZ23	LSZ35	LSZ37	LSZ38	LSZ39	LSZ43	LSZ47
4/8/2019	---	---	---	---	---	---	---	---	---	81	297	---	---	---	---	---	---	---	---	---	---	153	---	---
4/16/2019	---	---	---	---	---	---	---	---	---	150	520	---	---	---	---	---	---	---	---	---	---	210	---	---
4/23/2019	---	---	---	---	---	---	---	---	---	---	1140	6	---	---	---	---	---	---	---	---	20	1220	---	---
4/26/2019	---	---	---	---	---	---	---	---	---	---	570	18	---	---	---	---	---	---	---	---	70	1230	---	---
5/1/2019	---	---	---	---	---	---	---	---	---	---	1110	12	---	---	---	---	---	---	---	---	77	1180	---	630
5/8/2019	---	---	---	---	26	---	---	---	---	---	720	---	---	---	---	---	---	---	---	---	---	1440	---	---
5/13/2019	1	---	11	0	---	4	7	---	1	17	---	1	10	20	90	4	21	---	59	---	12	---	---	---
5/15/2019	---	---	---	---	---	---	---	---	---	---	1190	---	---	---	---	---	---	---	---	---	---	1425	---	---
5/22/2019	---	---	---	---	---	---	---	---	---	---	1450	0	---	---	---	160	---	---	---	170	---	1420	---	---
5/29/2019	10	---	60	0	230	10	30	---	10	270	2000	20	110	2000	1010	90	30	610	0	200	130	1430	---	---
6/5/2019	---	---	80	---	280	180	---	0	---	160	1240	---	180	320	930	100	---	630	0	290	100	---	---	0
6/11/2019	0	---	---	0	230	---	30	---	0	280	---	0	120	320	830	---	0	740	---	410	150	1410	---	---
6/18/2019	---	---	110	---	250	10	---	20	---	280	1080	---	120	570	1020	250	---	670	10	400	240	---	---	-
6/25/2019	100	---	---	80	240	---	610	---	0	370	---	0	110	450	860	---	10	630	---	200	90	720	---	---
7/2/2019	---	---	140	---	180	50	---	270	---	650	1270	---	150	470	920	230	---	540	40	370	130	---	---	0
7/9/2019	100	---	---	510	600	---	540	---	0	640	---	10	150	450	870	---	200	750	---	420	350	1220	---	---
7/16/2019	---	---	10	---	250	0	---	0	---	640	290	---	100	220	820	280	---	630	10	430	430	---	---	0
7/23/2019	90	1000	---	430	210	---	480	---	0	630	---	10	270	200	790	---	200	590	---	390	410	1150	---	---
7/30/2019	---	---	10	---	230	60	---	0	---	630	900	---	240	310	740	170	---	600	40	400	400	---	---	0
8/6/2019	90	480	---	450	270	---	500	---	0	800	---	off	250	660	780	---	200	760	---	290	530	1200	---	---
8/13/2019	---	---	0	---	200	40	---	0	---	580	1000	---	110	300	700	200	---	780	---	300	560	---	---	0
8/20/2019	70	600	---	450	240	---	470	---	0	540	---	off	100	650	800	---	190	740	---	250	610	---	---	---
8/27/2019	---	---	off	---	230	10	---	10	---	1370	900	---	130	560	720	340	---	690	---	290	750	---	---	0
9/3/2019	0	280	---	0	210	---	60	---	0	710	---	off	110	560	670	---	210	870	---	200	1000	---	---	---
9/10/2019	---	---	---	---	200	13	---	60	---	810	580	---	110	590	630	300	---	650	---	210	980	---	---	0
9/17/2019	10	1030	---	0	250	---	1800	---	0	470	---	off	100	510	590	---	280	680	---	360	970	---	---	---
9/24/2019	---	---	100	---	240	12	---	10	---	880	540	---	100	660	590	510	---	700	---	350	870	---	20	0
10/1/2019	0	760	---	0	220	---	1700	---	0	830	---	off	90	670	600	---	300	550	---	300	750	---	20	---
10/8/2019	---	---	40	---	260	30	---	0	---	820	600	---	80	710	570	400	---	720	---	340	1500	---	off	0
11/20/2019	120	650	3000	380	Off	100	20	0	700	600	480	Off	Off	790	470	120	2000	720	4000	400	2000	900	Off	0
11/26/2019	140	30	---	10	Off	---	Off	---	450	500	---	off	off	650	350	---	600	off	---	530	460	---	---	---
12/3/2019	---	---	100	---	off	130	---	10	---	---	350	---	off	off	320	370	360	---	130	---	60	1060	---	0
12/10/2019	120	140	---	110	off	---	40	---	100	off	---	off	off	700	350	---	470	off	---	100	800	460	---	---

CZ07

Screening location is an extraction location

CZ20

Screening location is a monitoring well

CZ18, UWBZ26, UWBZ27, LSZ09, LSZ23, LSZ37, LSZ38 and LSZ39 extraction shut down.

Suspect field screening results in October and November not included

Sulfate concentrations in several wells decreasing



Site ST012 Path Forward Nov-Dec

- **Continue SVE operation**
- **Continue pump repairs**
- **Pilot Study Implementation**
 - Continue mixing sulfate batches and inject according to plan (FVM7) Phase 1 subphase 3 injections with the modifications previously presented
 - Resample to confirm benzene at U02 and LSZ54 on a monthly basis. No response planned at LSZ54 currently. Will evaluate response options at U02 if concentrations are sustained.
 - Receive latest BART test results and deploy BioTraps® per recommendations in November slides (UWBZ26, LSZ38, LSZ39, W37)

Air Force Civil Engineer Center



***DRAFT 2020 BCT
MEETINGS/CONFERENCE
CALLS SCHEDULE
DELIVERABLE TRACKING***

**BCT Conference Call
19 December 2019**

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BCT GENERAL UPDATE AND ACTION ITEMS

**BCT Conference Call
19 December 2019**